CLAIMS

1. A constant-velocity joint having a tubular outer member having a plurality of axially extending guide grooves defined in an inner circumferential surface thereof and spaced at predetermined intervals, said outer member being connected to one transmission shaft, and an inner member inserted in an open internal space of said outer member and connected to another transmission shaft, wherein

said inner member (34) comprises:

a plurality of trunnions (44) projecting into said guide grooves (36);

a ring-shaped roller (48) held in contact with each of said guide grooves (36) and fitted over each of said trunnions (44); and

a plurality of rolling elements (46) rollingly interposed between each of said trunnions (44) and said roller (48);

said roller (48) having a flange (60) disposed on an inner circumferential surface thereof near a projecting end of each of said trunnions (44), said flange (60) projecting radially inwardly and circularly extending along said inner circumferential surface;

wherein an annular member (50) is mounted on said trunnion (44) near a proximal end (47) thereof;

said rolling elements (46) being retained between said flange (60) and said annular member (50).

2. A constant-velocity joint according to claim 1, wherein said annular member (54) has a beveled surface (52) produced by beveling an area thereof which is held against the proximal end (47) of said trunnion (44).

3. A constant-velocity joint according to claim 1, wherein a gap (X) is set between said annular member (50) and said rolling elements (46) for providing a predetermined distance (δ) by which said roller (48) is movable in an axial direction of said trunnion (44).

4. A constant-velocity joint according to claim 1, wherein said annular member (64) is disposed near an end face of said roller (48) facing away from said flange (60), and a gap (Z) is set between said annular member (64) and said end face for providing a predetermined distance (δ) by which said roller (48) is movable in an axial direction of said trunnion (44).

5. A constant-velocity joint according to claim 1, wherein a ratio (r1/D) of a radius (r1) of curvature of an outer circumferential surface of said trunnion (44), which extends from a cylindrical portion (45) of the trunnion (44), onto which said roller (48) is fit, to said proximal end (47) thereof to a diameter (D) of said cylindrical portion (45) is set to a range from 0.05 to 0.35.

6. A constant-velocity joint according to claim 1, wherein a gap K between said rolling elements (46) and said annular member (50, 54) or a gap K between said roller (48) and said annular member (64, 66) is set with respect to a distance δ by which said roller (48) is movable in an axial direction of said trunnion (44), according to the relationship:

$$K > \delta = R/2\cdot(1/\cos\theta max - 1)$$

where R: the radius of rotation of the center of said roller (48) around a central axis of said outer member (32); and

θmax: the maximum angle of tilt of said other transmission shaft (33) with respect to said one transmission shaft.

7. A constant-velocity joint having a tubular outer member having a plurality of axially extending guide grooves defined in an inner circumferential surface thereof and spaced at predetermined intervals, said outer member being connected to one transmission shaft, and an inner member inserted in an open internal space of said outer member and connected to another transmission shaft, wherein

said inner member (34) comprises:

a plurality of trunnions (44) projecting into said guide grooves (36);

a ring-shaped roller (48) held in contact with each of said guide grooves (36) and fitted over each of said trunnions (44); and

a plurality of rolling elements (46) rollingly interposed between each of said trunnions (44) and said roller (48);

wherein a gap H between a proximal end (47) of said trunnion (44) and said rolling elements (46) or said roller (48) is set with respect to with respect to a distance δ by which said roller (48) is movable with respect to said proximal end (47), according to the relationship:

$$H > \delta = R/2 \cdot (1/\cos\theta max - 1)$$

where R: the radius of rotation of the center of said roller (48) around a central axis of said outer member (32); and

θmax: the maximum angle of tilt of said other transmission shaft (33) with respect to said one transmission shaft.

8. A constant-velocity joint according to claim 7, wherein said roller (48) has a flange (60) disposed on an inner circumferential surface thereof near a projecting end of each of said trunnions (44), said flange (60) projecting radially inwardly and circularly extending along said inner circumferential surface; and

said rolling elements (46) are retained between said flange (60) and the proximal end (47) of said trunnion (44).

9. A constant-velocity joint according to claim 8, wherein the proximal end (72) of said trunnion (44) has a step (74), and rolling elements (46) are retained between

said flange (60) and said step (74).

10. A constant-velocity joint according to claim 9, wherein a radius (r2) of curvature of an outer circumferential surface of said trunnion (44) from a cylindrical portion (45) of the trunnion (44) to said step (74) is smaller than a radius (r3) of curvature of ends of said rolling elements (46) near said step (74) ($r2 < r3$).

11. A constant-velocity joint according to claim 7, wherein a ratio (r1/D) of a radius (r1) of curvature of an outer circumferential surface of said trunnion (44) from a cylindrical portion (45) of the trunnion (44) to said proximal end (47) to a diameter (D) of said cylindrical portion (45) is set to a range from 0.05 to 0.35.

12. A constant-velocity joint according to claim 7, wherein said roller (82) has on an inner circumferential surface thereof a first flange (84a) disposed near a projecting end of said trunnion (44) and projecting radially inwardly, said first flange (84a) circularly extending along said inner circumferential surface, and a second flange (84b) disposed near the proximal end (47) of said trunnion (44) and projecting radially inwardly, said second flange (84b) circularly extending along said inner circumferential surface; and

said rolling elements (46) are retained between said

first flange (84a) and said second flange (84b).

13. A constant-velocity joint according to claim 7, wherein a distance M between the projecting end of said trunnion (44) and ends of said rolling elements (46) is set with respect to a distance ε by which said rolling elements (46) are movable with respect to said projecting end, according to the relationship:

$$M > \varepsilon = 3R/2 \cdot (1/\cos\theta max - 1)$$

14. A tripod constant-velocity joint having a tubular outer member having a plurality of axially extending guide grooves defined in an inner circumferential surface thereof and spaced at predetermined intervals, said outer member being connected to one transmission shaft, and an inner member inserted in an open internal space of said outer member and connected to another transmission shaft, wherein

said inner member (34) comprises:

a plurality of trunnions (44) projecting into said guide grooves (36);

a ring-shaped roller (230) held in contact with each of said guide grooves (36) and fitted over each of said trunnions (44); and

a plurality of rolling elements (46) rollingly interposed between each of said trunnions (44) and said roller (230);

wherein a flange (242) is disposed on an end of said

roller (230) in an axial direction of an inside-diameter surface (240) thereof and projects radially inwardly, and a retaining member (246) is mounted on another end of said roller (230) in an annular groove (244) for retaining said rolling elements (46);

said retaining member (246) being disposed near a proximal end (47) of said trunnion (44) in an axial direction thereof.

15. A constant-velocity joint according to claim 14, wherein an axial thickness (L + ΔA) of a portion of said roller (230) with said retaining member (246) mounted thereon on one side of a central axis C extending diametrically across said roller (230) is greater than an axial thickness (L) of another portion of said roller (230) with said flange (242) disposed thereon on the other side of the central axis C, said central line C being in agreement with a center of said rolling elements (46) (B1 = B2) which divides an axial length thereof into two equal dimensions.

16. A constant-velocity joint according to claim 14, wherein said retaining member comprises at least a circlip (246).